PATENT SPECIFICATION (11) 1 368 715

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(21) Application No. 35278/72 (22) Filed 27 July 1972
(31) Convention Application No.
P 21 38 707.5 (32) Filed 3 Aug. 1971 in
(33) Germany (DT)
(44) Complete Specification published 2 Oct. 1974
(51) International Classification H01M 1/02 // 5/00
(52) Index at acceptance
H1B D12 D7 D8A D8F D8N D9E D9X

(19)

(54) AN ELECTRIC CELL

(71) I, WALDEMAR WITTE, a German National, of 17 Panoramaweg, Murrhardt, Germany, do hereby declare the invention,

for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to an electric cell having galvanic elements accommodated in a tubular housing of which one end surface is closed by a cover.

Galvanic elements have hitherto been accommodated in housings of metal, particularly of nickel-coated steel plate. These housings consist of a container, a cover and a packing by which the housing and the cover which are of opposite polarity, are electrically insulated from each other. Since the housing parts are of opposite electrical potential and naturally rest very closely together, cells of this kind are subject to the considerable risk of short-circuiting therebetween.

In many cases cells of this kind do not consist of individual elements but of batteries made up of a number of cells connected in series, as the intrinsic voltage of the cells, i.e. 1.2—1.5 V, is usually insufficient. Multi-cell housings of this kind are produced with metallic housings the first of which is affixed to the cover of the first cell by spot welding, after which it is connected by a further welding operation with the second cell inserted therein. The insertion of sets of electrodes into metallic housings of this kind, as well as the assembly of the separate cells to form batteries, has to be carried out with great care in order to avoid internal and external short circuits. This is why special transport pallets, with holding devices situated at a distance from one another, are required for the transport of these known cells accommodated in metallic housings.

The present invention may provide electric cells of the kind described, which can be produced with a considerable saving of time and labour and in which the danger of internal and external short circuits is practically eliminated.

According to the present invention there is provided an electric cell including a tubular housing of plastics material, galvanic elements mounted in the housing, a wall member integral with the housing and located intermediate the ends of the housing to divide the housing into two chambers receiving the galvanic elements, a cover arranged on each end of the housing to close the chambers and a separate electrically conductive terminal member located in each of the intermediate wall and end covers. This makes it possible to produce the housing in one single injection moulding operation, after which it is only necessary to introduce inserts of electrically conductive material.

The electrically conductive terminals are preferably held in recesses or apertures having surfaces complimentary to the outer surfaces of the terminals and provided in the plastics parts, so that they can be produced in a simple manner without any special securing devices.

It has been found advantageous for the plastics housing to be constructed as a cylindrical body of which the end faces of which are each provided with a flange forming a support for a respective end cover. After the insertion of the galvanic elements in the housing, the covers and the end surfaces of the housing may be sealed for example, by thermal means, high frequency means, ultrasonic processes or by the use of an adhesive.

A plastics housing of this kind offers the advantage, by comparison with known metallic housings described in connection with batteries hitherto known, that it is particularly simple and inexpensive to

produce and that the danger of short circuiting is avoided.

In order to prevent lateral displacement of individual cells introduced into the housing, it is advisable for centering lugs to be provided on the inner wall of the plastics housing while the latter is being injection moulded.

In a housing so constructed the connection of an electrically conducting terminal with the cells is likewise a simple matter, e.g. by providing on the inside of a cover a contact spring extending into the housing and connected with the terminal.

If the plastics parts consist of transparent plastics the system offers, by comparison with the metallic housing hitherto known, the advantage that any anomalies such as the inflation of the cells after long use can be seen without difficulty.

A constructional embodiment of the invention will now be described by way of example with reference to the accompanying drawing; wherein,

Figure 1 is a view of a transparent double-chamber housing, in perspective, and

Figure 2 is a partially exploded longitudinal sectional view through a galvanic cell in the plastics double-chamber housing of Figure 1.

Referring now in more detail to Figures 1 and 2, there is shown a cylindrical housing which serves to accommodate galvanic cells 11, 12, 13 and 14, in the present case constructed as "button cells". The housing is a double-chamber housing in which two cylindrical chambers or cavities are formed. This result is achieved by means of a cylindrical plastics body 18 made in one piece and containing a cylinder wall 18*a* with an intermediate base 18*b* situated centrally thereof. The intermediate base 18*b* is provided with a central recess or aperture in which an insert 19 of electrically conductive material is secured by means of two central lugs 18*c* belonging to the intermediate base, which engage correspondingly complimentary shaped profile sections of the insert 19.

To enable the double-chamber housing 18 to be sealed after the insertion of the cells 11, 12, 13 and 14 and also of cell separators 15 and 16 situated between them, covers 20 and 21 are provided which are likewise made of the same plastics as the housing and which have central terminal pieces 22 and 23 of an electrically conductive material. These are connected with the plastics cover as has already been described in connection with the intermediate base. The operation of fitting the electrically conductive terminal pieces 19, 22 and 23 into the plastics parts can be carried out in the course of the injection moulding process, the terminal pieces being held fast in the plastics mould by means of a light vacuum, the molten plastics flowing around them during the injection moulding process, so that the terminal pieces are enclosed in it. As the expansion coefficient of the plastics is greater than that of the metal the connection becomes permanent after the cooling. The system also ensures a completely gas tight and liquid proof electrically conductive connection between the sets of electrodes themselves without any danger of short circuiting.

Contact springs 25 and 26, projecting inwards, are provided on the terminal pieces 22 and 23 of the front plates 20 and 21 and can be rivetted or welded to the terminal pieces. The arms of these contact springs extend inwardly, thus ensuring firm bearing and contact pressures. To prevent lateral displacement of the sets of cells within the chambers, centering lugs 27 and 28 can be provided on the internal periphery of the casing, these being formed during the injection moulding process.

The terminals in the intermediate base of the chamber and in the end or cover plates may consist of steel, chrome nickel steel, nickel or other suitable metallic or electrically conductive materials. After the cells 11, 12, 13 and 14 have been inserted in the chambers the relevant end cover plates 20 and 21 are fitted by an inner flange onto a complimentary projecting edge of the end surfaces of the plastics housing and are fixedly interconnected on these support surfaces by the use of an adhesive, the effect of heat, high frequency or ultrasonic welding processes. Since all the plastics parts consist of one and the same homogeneous plastics material there is no danger of any electrolytic communication between the two chambers. The synthetic material used may consist, for example of suitable thermoplastic substances of the co-polymer type.

By comparison with the metallic housings hitherto known this housing is not only produced with a considerable saving of labour and time, but is also far less liable to undergo short circuiting. The plastics housing provides a great saving of weight compared with the metallic housings, the saving being approximately 30%. If the synthetic material is also transparent the system offers the additional advantage of visibility from the outside. Owing to the elimination of the danger of short circuits, no special safety measures or packing devices are required for transport purposes.

The plastics housing described offers the additional advantage that it can also be used as part of the housing for a low-current appliance, such as an electric pocket torch, electric razor etc., as the plastic

housing, together with the appliance operated by the cells, possibly with the interposition of the other components, is connected up to the mains for re-charging without the need for any special insulation or covering.

WHAT I CLAIM IS:—

1. An electric cell including a tubular housing of plastics material, galvanic elements mounted in the housing, a wall member integral with the housing and located intermediate the ends of the housing to divide the housing into two chambers receiving the galvanic elements, a cover arranged on each end of the housing to close the chambers and a separate electrically conductive terminal member located in each of the intermediate wall and end covers.

2. A cell as claimed in claim 1, wherein a single terminal member provided in the intermediate wall for interconnecting galvanic elements in each chamber is mounted in a recess in the intermediate wall, the recess and terminal member having complimentary engaging surfaces.

3. A cell as claimed in claim 1 or 2, wherein the double chamber housing forms part of a housing of an electric pocket torch.

4. A cell as claimed in claim 1, 2 or 3, wherein the plastics material is transparent plastics material.

5. A cell as claimed in any of the preceding claims, including centering lugs integrally moulded on the inside wall of the housing.

6. A cell as claimed in any of the preceding claims, wherein the electrically conductive terminals are provided in the wall covers during moulding thereof.

7. A cell as claimed in any of the preceding claims, wherein the housing is in the form of a cylindrical body having a flange forming a support for a cover on each end face thereof.

8. A cell as claimed in any of the preceding claims, including a contact spring mounted on each cover and connected with the cover terminal, which spring is arranged to project into the housing.

9. An electric cell substantially as described herein with reference to and as illustrated by the accompanying drawing.

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Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1974.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

Fig. 1

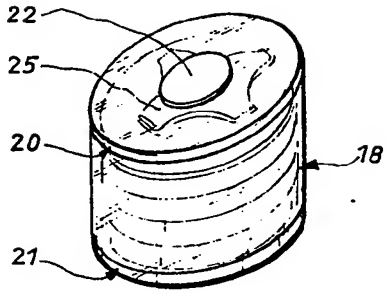

Fig. 2